



JANUARY 1988

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# Ø BEAT



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The Pikes Peak Radio Amateur Association meets on the second Wednesday of each month at Giuseppe's Depot Restaurant at 10 S. Sierra Madre at 7:30 p.m. All amateurs and interested parties are invited to attend.

Editor: Keith Goobie NYBT, 5335 Coneflower Ln., Colorado Springs, CO 80917 637-1525

## The RF Concepts RFC 2-23 Amplifier

by Bdale Garbee, N3EUA

I've been running a QRP packet station ever since my move to the Black Forest area, primarily because my only functional 2m radios are a Kenwood 2800 HT and a Kenwood 21AT HT. I'm working on getting an old crystal rig on the air for packet, but in the meantime I needed a few more dB to get solidly into town. Since I've wanted an amp to use in my car with an HT anyway, I decided it was time to buy one! I could put it on packet "now" until I get the crystal rig on the air, and then move it to one of my cars. The goal was an amp that would do 20-30 watts with my HT's, and was from a company that I'd heard of and was known for reliable equipment. Since many amps include a GaFET preamp for receive, and that seemed like a useful toy, I added that to the list of requirements.

While scanning magazine ads, I discovered a name I hadn't heard before, RF Concepts. Their model RFC 2-23 seemed to be exactly what I wanted, and had a list price somewhat lower than what Mirage amps (my first choice) sell for on sale. So, I did a little research. It seems that RF Concepts is a relatively new company, formed by two of the folks who started Mirage. I decided to give it a try.

I called CW here in town, and sure enough, they had the model I wanted in stock. They didn't know much about the company or the amps, but had gotten in a few to try out. I picked one up at lunch the same day! The amp is spec'd for an input of 200mW-5W from 143-149Mhz. The output is rated at 30W for 2W of input. With my Kenwood 2800 on high power, and an SWR on the antenna side of

about 1.3:1 (measured on the SWR meter John Conner WD0FHG won at the December club meeting), the amp puts out about 25W. I should comment that the power supply I'm using only puts out about 11V, but since transistor amp stages are primarily current-driven devices, I didn't expect a problem and haven't seen one. The preamp power supply is regulated for 5V anyway.

The amp is rated for intermittent duty on all modes. The preamp and amp are totally independent, so you can run neither, either, or both. There is an SSB/FM switch that adds a cap in the SSB position to slow down the T/R switching time for SSB. The amp also has automatic shutdown when the SWR exceeds 3:1. The input and output are standard UHF SO-239 connectors, with a 2-pin Molex for power. The current consumption is specified as 4amps at 13.8V, with the unit fused for 7amps. With a 3.6A supply, I could run it with the HT on low power, putting about 7W out of the amp. Full power on the HT caused the supply to crowbar.

I haven't used the preamp much, but in one test it seemed to be doing a fine job. I've been impressed that even with fairly heavy usage on 2m packet, the heat sink has not yet gotten warm to the touch at all, even with 25W out. At only 2 lbs and 8.5x3.5x2 inches, it's going to be a breeze to mount in one corner of a trunk with the supplied mounting strap, and I'll have no fears about the amp overheating.

I obviously can't report on the long-term reliability yet, but with the schematic included, and no unusual parts, I don't anticipate there'll be any trouble repairing the unit if it does go down. All in all, I'm very happy with the RF Concepts RFC 2-23 amp on FM, and would quickly recommend it to anyone needing a little more punch than their HT can provide.

## "THE VIEW FROM THE PEAK"

by George Hinds, N8CIX

"LETTER PRESSURE" will help save 220-222 MHz for Hams.

Reports indicate that the vast bulk of letters to the FCC on Docket 87-14 are from amateur radio operators, protesting taking a portion of 220 MHz for the land mobile service. Very little comment has been in evidence from those who allegedly would use the spectrum.

Now that formal comment periods have passed, the pressure from amateurs should be in the form of letters to senators. It's only necessary to tell them of what Docket 87-14 would do to harm amateur radio operators, of how little support the Docket has from alleged potential users, etc.

The end result of a letter or letters asking your senators to investigate the harmful effects of the proposal in Docket 87-14 and to protect the interests of their amateur radio constituents will be of great help to our cause: a stack of what I term "letters of concern" from senators will have a significant influence upon the Commissioners at the FCC. If you need further info, check recent issues of "QST" to find the words.

### SOMETHING NEW IN CANADA?

Amateurs across the border expect soon to see a document from their Department of Communications that will restructure ham radio in Canada. It is

reported that the proposed new rules to govern the Canadian Amateur Radio Service will provide for an all mode "entry level" license for basic amateur privileges that will not require knowledge of Morse code. It is reported, though, that a written test will be a must for operating on amateur frequencies above 30 MHz.

### "UNCLE" CAN GET TOUGH!

A San Diego amateur, as noted in newspaper reports, faces a fine of up to 250K and up to a 10 year prison term after pleading guilty to interference with FBI radio transmissions. He (Jerry E Gastil, K6DYD) is to be sentenced January 25. The report terms him a "music player" over FBI tactical frequencies in the period between 4/1 and 4/10.

It's apparently not the first problem for him; in 1986 he was fined for operating a pirate broadcast station on 7434 kHz and, in 1985, he was fined for operating a repeater in San Diego without identification.

### IS IT TIME FOR RENEWAL?

Right now! is the time to pull at least two items from your wallet and check the expiration dates: one is your license to drive a car, the other is your license to operate your ham gear. (You might also see what expiration dates are on your credit cards, etc.)

To renew your amateur license, attach a copy to a 610 form; send to the FCC, Box 1020, in Gettysburg, PA 17326. No fee is required.

If your license has quite a while yet before expiration, jot down a note of reminder on the calendar so that you'll be sure to file for renewal well in advance of expiration (90 days before is suggested). Doing so insures that, if the new license is slow in coming, you may continue to operate pending arrival. Should you fail to file prior to expiration, you are "off the air." And remember: when filing for renewal or modification, your new license will be issued for a period of 10 years.

SANTA CLAUS SMILED ON ME and now I'm the proud (and in debt) owner of a new HF rig: the ICOM 735! Much of my spare time of late has been spent in reading the manual to find out what all the buttons, knobs, etc., are used for. I'm still reading and learning - for these HF jobs are like flying on instruments: your head is in the cockpit on the gauges!

I'm following the pattern set when I erected my 2 and 440 antennas: hide 'em in the trees besides the house - out of sight, out of mind - at least to the neighbors.

So now there's a 10 thru 80 dipole going up (when the temperature gets high enough to avoid having frozen hands) along the tree line of the property. For now, a simple dipole in the shack cut for 10 meters has brought in the east and west coasts so I'm pleased. Happy New Year! 73,  
George N8CIX

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## SEC MEETING · NL7CO,

### AEC/OPS

On 19 Dec a meeting for all of the Eastern Slope Emergency Coordinators (EC's) was chaired in Littleton by the ARRL Section Emergency Coordinator (SEC), WA0TUB, and the District Emergency Coordinator (DEC), K4UBU. Among the items discussed were the current status of the ARES on the Eastern Slope, standardization, and a proposed certification for the EC's. Attending from District 14 were the EC, N0CMW and the Assistant EC · Operations (AEC·OPS), NL7CO

## ARES MEETING

There will be a general meeting of the District 14 (El Paso and Teller Counties) Amateur Radio Emergency Service in the El Paso Emergency Operations Center on 16 Jan 88 from 1400-1600 hrs. The meeting will be repeated at the same time on the 17th. Everyone interested in ARES should plan to attend at least one of the sessions.

## RACES

Is anyone a current, card carrying member of the Radio Amateur Civil Emergency Services? If so, please contact Al, N0CMW or Don, NL7CO

# VHF & ABOVE NEWS

December was a very good month for VHF. On December 22, Six meters opened from 0200 to 0430 coast to coast. Several stations reported hearing Europe and K5UR reported working New Mexico from Arkansas on Two Meters. I worked several pages of log in one hour. I hope this is a glimpse of what the new sunspot cycle will be like!

The January VHF Sweepstakes is just around the corner, the weekend of January 23-25. See QST November 1987 for details.

**SOLAR CYCLE UPDATE:** The minimum Sunspot number for cycle 21 occurred in Sept. 1986 with a value of 12.3 (fairly high). This would seem to indicate that cycle 21 duration is on the low side of the 8 to 13 year range (around 10 by current estimates). Early indications of the peak of cycle 22 is about 145 for a maximum value. This is somewhat lower than cycle 21's peak. Most agree that whatever the peak of cycle 22 might be, it will occur in mid 1990. These predictions will become more accurate as the cycle begins its slow climb over the next six months or so. If all this is accurate, expect conditions to gradually improve until a solar flux reading peaks between 160 and 180. Then expect reasonably good propagation spread over a 2 year period (?1990-1992). If all this seems like trying to predict the Dow Jones average for 1990 your probably right but a lot of high powered scientists have spent a lot of time working out these predictions and odds are they will be pretty close!

Lunar perigee will occur on the eighth of January with a full moon on the twentieth.

An intense but short duration meteor shower, the Quadrantids, will occur between January 2 and 4.

The long awaited arrival of the Yaesu FT 736R has been postpone again. Word has it that the ongoing trade problems with Japan are beginning to affect new electronic gear by slowing down customs processing.

That's the news as I know it ... 73's and hope everyone got a radio goodie from good ole ST. NICK!! C U on the bands...RON NK0P



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## ANTENNA SYSTEMS BY KD0SO

Last month, we looked at the aspect of receiving, using an em-expensive, receiving loop antenna. I should have told you, just a couple more points. Feed point impedance of a loop at the center, of a leg, is about 117 ohms, hence the use of 300 ohm twin lead, into a tuner; using a 4 to 1 balun at input, to get a matched load.

Well what about the transmit side of things. Getting a signal to radiate at low angles for DX, is what we really need.

There are several possibilities but, I'm the type who wants it all. Since I have a tri-band beam, I'm not overly concerned about 20 meters and up. The beauty here is the beam can act as a TOP HAT, if I load the tower. Now 40 feet of tower, does not a 160 meter antenna, make. So how then, do I do this and make it so I have 10-160 meters, for vertical radiation and low angle too?

One of the methods is an old trick. Use of a Sloper, to make the tower stub loaded, at the top. You will recall I have about a 70 foot on the sides, back yard. A sloper for 160 meters is about 134 feet long. With the tower in the middle of the yard, I only have about 60 feet of space, from the tower to the corner of the yard.

ANSWER: Place some coils in the sloper and fake the length. Note\* no traps please.

Now I don't want to go into a lot of figures or formulas here so I will simply describe the physical dimensions for you and take out all the guess work.

We start with wire, remember all that I had left over from the loop? In the last article? We need a piece about 34 feet long, put an insulator on one end. On the other end add a coil. To this coil we add 10 feet of wire, then another coil. To this coil we add about 9 feet of wire and an insulator.

The first coil is a form of white schedule 40 PVC tube, 5.25 inches long. Closely wind a coil, using #20 or #22 enameled wire length 3 inches, centered on the form.

The second coil uses the same material. The form length is 7.5 inches in length, coil length is 5.5 inches, centered on the form.

You should be able to buy the spool of enameled wire from a motor rewind shop, with out

to much trouble and at a reasonable cost. About four to ten dollars for a used spool of about 250 feet.

When put together this will form a tri-band sloper for 40,80 and 160 meters. Mount the antenna to the 30 foot level of the tower. Note\* Min. mount height is 25 feet and max mount height is 40 feet. 30 feet works best of all heights.

Use 50 ohm coax to the antenna. Center conductor to the antenna and shield to the tower. Using a tuner will really give you true broad band performance. If you select to not use a tuner, then prune the antenna, first at the 40 meter leg, then the 80 meter leg and lastly the 160 meter leg. Trim at the coil ends for 40 and 80 meters. 160 meters is trimmed at the insulator end. Keep the end of the antenna about 10 feet off the ground, for safety sake.

Beneath the tower I put out four radials at 65 feet (Remember all that wire from my initial purchase). Then four radials at 35 feet. The radials really are a large part of an effective radiating system on a vertical antenna. Use them. Yes you can get by with out them but, the effectiveness of the antenna will leave something to be desired. The radials should be evenly spaced and straight. If you can't lay them straight, then bend them some, I had to on three of the radials. It's ok.

Performance is remarkable. I quite often get comments like; "Your the loudest thing on the band." "Fantastic" "Awesome"; Receiving wise, it won't match the loop but, it does hear with a lot less noise than a Vee or a pure vertical.

Note\* the more radials you can put on any vertical the better the radiation pattern will be and the lower the radiation angle. The ideal number of radials is at 120. The ideal height of an antenna is 5/8 wave. Now using a 40 foot tower on 20 meters, we begin to approach that height and the performance of the system, gain wise exceeds that of a dipole antenna. AT 5/8 wave with 120 radials you approach very close to 0 degrees angle of radiation. For DX that's great. On one occasion I worked Lower Hull Island, near New Zealand, with this vertical and received a report of 15 + 8 at 23:30 local.

73's KD0SO PAUL

Diagram on Page 7

# OEM Parts

INC.

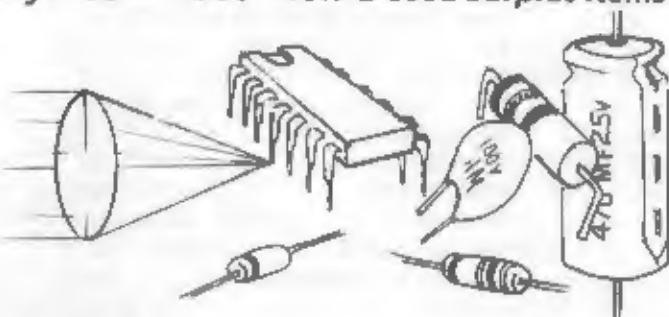
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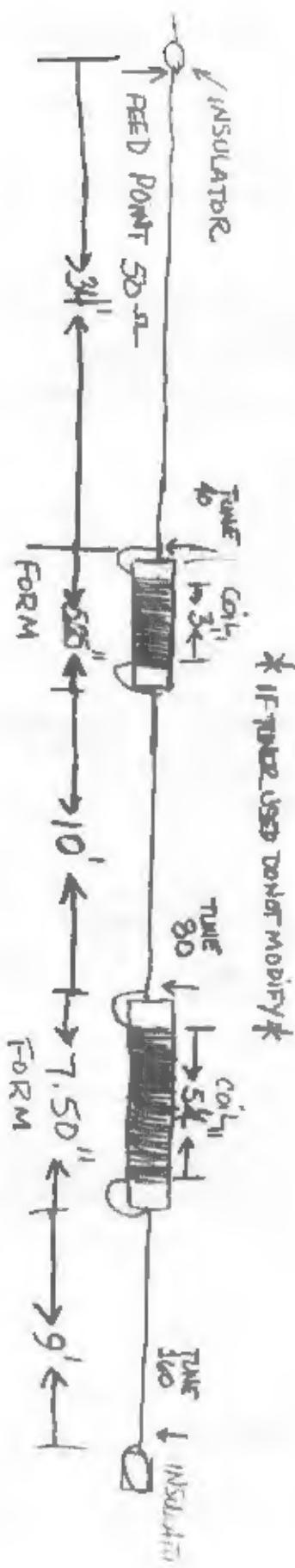
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# ANTENNAS

By Chris Smith

N7CE

We interrupt the regularly scheduled column on MININEC3 to bring you the following special feature....

My new rhombic antenna is complete! From what I can tell, it works much as the computer predicted, and loads up quite nicely on all bands from 80 to 10 meters (including WARC bands). I've aimed it to the northwest and time and skies will tell if it has much gain in the desired directions.

It is a single wire rhombic, 140 feet on a side, with a 60 degree "tilt angle," that is, a 60 degree angle at the feed point and end termination, and 120 degrees at the side apex. It is roughly 40 feet in the air, though wire sag and terrain variations make much of it lower.

Since it is a single wire rhombic, it is best suited for an 800 ohm feed and termination. I wound an 800 ohm balun, and learned enough in the process to make a good future column. The end termination is 840 ohms, made up of series-parallel combinations of 84 two watt resistors, each 840 ohms. The resistors at the far end do two things; they absorb power which would radiate in the back direction and thus make the pattern unidirectional, and they even out the impedance variations with frequency and thus contribute to the flatness of the antenna on all HF bands. Of course, there is a price for their action; they cause the antenna to be lossy. The efficiency of the antenna varies from 15% on 80 meters to 80% on 10 meters.

At the low end the antenna should have a gain of about 3 dBd (dB with reference to a dipole), including losses, at the pattern maximum. On 15 through 10 meters, the gain rises to 12 dBd at the pattern maximum. From 20 meters on up, the maximum is not along the center of the rhombic. The pattern splits, with one lobe north of the center and one south. Since I am looking to cover an arc of from 270 degrees through 330 degrees, this double pattern is ok.

We now return to our regularly scheduled column....

Let's plan a sample run of the MININEC3 program, to review some of the key ideas of what it can do for us. We will describe an antenna to the program, and also include certain necessary information about the environment and frequency. The program will "digest" this information, and then

let us know some things which will result. It will tell us roughly how the current is distributed on the antenna, what power may be absorbed by it (remember the resistors on the rhombic?), what the impedance is where we are driving the antenna, and what its pattern is. Of course, depending on how well we do our job, and how well the computer does its job, the answers may be right on, or baloney. Part of using the program will be to learn how to tell which is which.

Beginners should start with a simple case. Let's consider a "half-wave" dipole in free space (ie. way above ground so the ground need not be considered). Run the program. It will ask you if the output should be sent to the console, printer or a disk file (C/P/D)? Select 'C' which is the console, or screen. Right away, you may learn one quirk of MININEC3: Only uppercase works! Yes, we know that user-friendly software should accept either, but after 1800+ lines of code just to make the program work, programmers can become downright UNUser friendly! In general, if you supply MN3 with a response that is syntactically incorrect, either BASIC or the program will ask you to repeat the input. If, though, you give a response which is ridiculous but syntactically correct - well, garbage in, garbage out, as the old saying goes.

The program will ask for a frequency in MHz, respond with 3. This is a wavelength of about 100 meters. Next choose free space by answering the query with +1 or just 1. Continue by specifying 1 wire and 40 segments. That is, the wire (which you have not yet described) will be broken up into 40 segments, each with a unique current, and the program will then solve for all 40 values of current. (If you think that's easy, try it sometime.)

Now you will begin to describe the wire to MN3. All dimensions must be in meters, so get out your calculator if you must do conversions. MN3 specifies wires by their two endpoints and its radius. The wire is assumed to be perfectly straight. If your wire curves, you must approximate it by several straight wires. Remember, a wire in MN3 is always straight, running between two endpoints and having a wire size of the radius you specify.

The endpoints are given in Cartesian coordinates, ie. X, Y, and Z. If you need to refresh your memory on Cartesian coordinates, find an algebra book, or a geometry book (or a mathematician, or just me at the breakfasts).

I will conclude this sample program in the next column. In the meantime, reading section 4.0 of the MININEC3 manual may clear up some questions you may have. Until then, 73 es CUL... QRTZ da N7CE

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## MINUTES OF DECEMBER GENERAL MEETING

*submitted by Al NOCMW, secretary*

The general meeting of the Pikes Peak Radio Amateur Association was held at Giuseppe's Old Depot Restaurant, Wednesday evening 09 December 1987. The meeting was called to order by the president Ron NKOP at 19:30. There were 58 members and guests present.

The minutes of the previous General Meeting and Board meeting were approved as printed in the Beat, with one minor correction that the call for Bob was NR0O and not NR0Z as was printed.

### Committee Reports

**Note:** Anyone wishing to help out on any of these committees, please contact the chairman at the phone number listed. Thank you for your support.

#### Treasurer - Bud NODDF (599-7699):

Previous balance was \$1262.88, income of \$189.00, expenses of \$367.25 leaving a balance \$1064.63.

#### Interference - Ron NKOP (593-8352):

Nothing new to report.

#### Education - Harley KC0TQ (634-4555):

Tech / General classes will end on Dec 18, 1987.

#### Publicity - NOCALL:

A new publicity chairman is required by the Club. No special qualifications are required. No new info was presented by club membership.

#### Colorado Council of Amateur Radio

#### Clubs (CCARC) - Oak K0ROL (903-3900):

Oak K0ROL will now take over as the new chairman/representative for the club.

#### Deaf and Blind School - Jim WA9ABB:

(598-7543): The Icom 730 is now in place and it seems to be performing well. There is still a requirement for Elmers for the School.

#### Q-Bat - Keith NYOT (637-1525):

Keith was absent due to military duty and Ron NKOP thanked everyone for all the articles to date and looks forward to everyone's continuing support.

#### ARES - Al NOCMW (473-1860):

The ARES Net meets each Wed evening at 1900 local on the 37/97 repeater with 16/76 and 6.520 simplex as backups. Thanks to all those who have checked in so far and contact Don NL7CO or Al

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**TAB BOOKS**

NOCMW for more info. Both have applications and need continuing support, especially for the net.

#### Public Service - Mike K0TER (636-1290):

Les, KC0NC filled in for Mike and stated that had attended some meetings on events coming up in the future.

#### Old Business:

Bill WB2EVR thanked the traffic net for their assistance.

#### New Business:

There will be no swapfest this year if no one volunteers to organize it. Ron NKOP asked if the club really would have the support from its membership to make the thing go this year. Over half in attendance wanted to have one and when another call was made for volunteers, Les KC0NC finally came to the rescue and volunteered. Our thanks to Les.

Torpe W0ZOM discussed getting a radio and antenna for the senior citizen centre on Hancock. He needs assistance, especially in the area of dealing with the bureaucrats. He can be contacted at the computer room.

January will be home brew night and Keith NYOT will have prizes for the three top entries.

A short intermission was held and then Jim WA9ABB conducted the Christmas raffle for Keith NYOT (thanks Jim!).

Prizes - Keith NYOT:  
(Christmas Raffle)

Winners were:

N0LA Pete - Astron Power Supply  
WD0FHG Jim - SWR Bridge  
AH8GF Irene - Mag mount ant (2m)  
KA0ZDY Jeff - Handbook  
KA0TTF (sorry) - Handbook  
Terry O'Connell - External Speaker  
(prospective Novice)

Program:

The program was the presentation of the video session that Jim WA9ABB had with one of the local television stations (channel 11). After review by the club membership, Jim was complimented for the professional way in which he conducted the interview and for the manner in which he portrayed the technical and public service aspects of Ham Radio. This was done while he was the Publicity Chairman for the Club.

The meeting was adjourned at 2145

The next meeting will be 13 Jan 88.

**MINUTES OF DECEMBER BOARD MEETING**  
submitted by AJ N0CMW

The board meeting was held on Monday 14 Dec 87 at the home of Ron NK0P. Meeting was opened by President Ron NK0P at 1900 hrs. Present were Bud N0DDF, Keith NYOT, Les KC0NC, AJ N0CMW, Chris NX0E, Nick KG5N, and Ron NK0P.

A call was made to Miley's Radio and he agreed to the club proposal the the swapfest be held on 21 May 88. Bud N0DDF will talk with the Mall Manager to determine if the date will be acceptable with the Mall. The door prize for the Swapfest will be a Kenwood TS140+ and tickets will be sold for \$1.00 each or the bargain price of 10 for \$10.00 (hi). The secretary will notify the Colorado section manager of the change of date in the swapfest.

Ron NK0P will talk to the committee members for Programs and Entertainment and let them have the responsibility for organizing the Programs for the monthly meetings. Tentative programs for January are the home-brew night and a possible discussion on the traffic net. Feb is tentatively set to have a discussion/presentation on satellites.

The next Board meeting will be held in the home of Ron KA0ZHO.

Those wanting to help Les KC0NC with the Swapfest, he may be reached at telephone 634-1001.

There being no further business, the meeting was adjourned at 2100 hrs.

## **COMMITTEES**

The following represents the list of those who volunteered to fill in on the various club committees.

ACTIVITY COMMITTEE

Renay Borst KA0ROY  
Jeffrey Boyes KA0ZDY  
Donald Martin KA0ZDZ  
George Lewis N0HDX

PUBLICITY COMMITTEE

Karen Honer N1FED  
E. J. Lund KD0NB  
Don Ross NL7CO  
Don Hohlsel KE0QJ

MEMBERSHIP COMMITTEE

Jody Borst KA0ROZ  
Doug Brower N0HJT

AUDIT COMMITTEE

Les Borst KC0NC  
Chris Smith NX0E

TECHNICAL INSTRUCTION

Harley Hansen KC0TQ  
Nick Hulbert KG5N  
Bud Libengood N0DDF  
Mike Martindale K0MRE  
Bob Haggard N0CTV  
Ray Uberecken AA0L

BEL COMMITTEE

Ron Deutsch NK0P  
Bdale Garbee N3EUA  
Jeff Boyes KA0ZDY  
Ray Uberecken AA0L

PROGRAMS & ENTERTAINMENT

Malcolm Benten KE9S  
Karen Honer N1FED

## **JANUARY MEETING**

The next regularly scheduled meeting for the Pikes Peak Amateur Radio Club will be held on Wednesday, January 13, 1988 at 7:30 pm at Giuseppe's Depot at #10 Sierra Street.

This is the annual Homebrew Night.

## MILEY'S RADIO

Jess KØTAA 719 W. 7th St. Florence, Colorado 81226 (303) 784-3040  
 Hours 9 to 6 Tuesday through Friday — Saturdays 9 to 1 — Evening Hours 7:30 to 10 (Call Ahead)  
 Closed Saturday 1 PM; Sunday & Monday  
 Next Hamfest 1st Weekend of February 1988  
 Littlefield, TX

### NEW EQUIPMENT IN STOCK

Kenwood TS140S \$785.  
 Kenwood TH25AT New Mini HT \$285.  
 Kenwood TS 440S \$935 w/AT installed \$1095.  
 Kenwood TS 940S \$1735, w/auto tuner \$1995.  
 Kenwood TS 430S \$745.  
 Icom 735 \$850.  
 Icom 751A \$1395.  
 Icom 761 \$2100.  
 Yaesu 767GX \$1425.  
 Yaesu FT 737GX \$780.  
 Yaesu FT 737GX Mk. II \$925.  
 More Kenwood, Icom, and Yaesu HF equip. & accessories at equally low prices.  
 New Kenwood TR 751A 2 meter all mode w/GaSFet preamp \$560.  
 Kenwood TM 2570A 20 watt 2 meter FM mobile \$498.  
 Kenwood TM 2550A 45 watt 2 meter FM mobile \$425.  
 Kenwood TM 2530A 25 watt 2 meter FM mobile \$398.  
 Kenwood TH 215A \$310.00.  
 Kenwood 211A \$300 (1 only).  
 Kenwood TH 215A \$310.  
 Kenwood TM 221A-\$365 / 321A-\$380 / 421A-\$365.  
 Complete line of Tokyo High Power amps, preamps & tuners at lowest prices.  
 Icom 48A 440MHz \$423 - W/TTP.  
 Icom 28A 132-174 MHz scan/receive 25W \$395 W/TTP.  
 Icom 28H same specs as Icom 28A w/45W \$423 W/TTP.  
 Icom u2AT \$265.  
 Icom 2AT HT \$235.  
 Icom 02AT \$237.  
 Icom 02AT w/BP7 8 watt battery & wall charger \$335.  
 Icom 4AT \$280.  
 Icom 04AT \$380.  
 Icom 3200A 2 meter/440 dual bander \$525.  
 Icom 27SH 1 only \$1185.  
 Icom 47SA 1 only \$1199.  
 Icom 900 Basic Controller \$510.  
 Daiva Meters, Switches & Boxes - In Stock - The Daiva rotor is great!!  
 Mirage Amps - Low Prices - In Stock.  
 KDK FM 240 min 25W w/TTM & LCD display, encoder/decoder TO 156 MHz receiver \$300.  
 W/2 tone \$290.  
 Yaesu FT 209RM 5 watt FM HT \$275. 1 only.  
 Yaesu FT 2700RH 2 m-70 cm dual bander full duplex \$490.  
 Yaesu FT 727R 2/70cm HT - New CPU \$419.  
 Yaesu FT 23R 2 Meter HT w/TT Pad \$285.  
 Yaesu FT 73R 70 cm HT w/TT Pad \$275.  
 Yaesu FT 211 BH \$395.  
 Ten Tec Corair II HF conv. \$1195.  
 Ten Tec Paragon \$1720.  
 Tokyo HI Power 37V 2-25 Gas Pet Preamp \$95.  
 Astro P5 - ALL AMPS - Low Prices.  
 Weiz 684 meters in stock - all power levels and frequencies.  
 Hustler 5BT & 6 BTW In Stock \$120/\$140.  
 All Butterman antennas at competitive prices.  
 RKC and VE System Amps & PreAmps.  
 Nye Viking Power Monitor 5000W \$205.  
 Ameritron Amplifiers - AL 80A - 1.3-500Z - In Stock \$795 AL 84 4-6M16 \$395.  
 Ameritron remote antenna switch - RCS 4 & 8V - \$120.  
 AEA PK 232 data controller internal HF/VHF modem \$290.

Kantronics KAM all mode controller - HF/VHF/CW/RTTY/ASCI/AMTOR or Packer. Now with T1E \$295.  
 All Kantronics controllers & interface units in stock at lowest prices.  
 MF wet & dry dummy loads, tuners & keyers in stock.  
 MF 989B roller inductor tuner \$310.  
 MF 962B 5 KW tuner 160 to 10 meters \$195.  
 MF 1270B packet controller (TNC-2) \$129.  
 New MFJ 1274 HF/VHF switchable packet controller \$149.

### USED EQUIPMENT

Kenwood TS440S w/AT - nice cond - SSB Filter \$950.  
 Kenwood TS120S - nice - \$350.  
 Kenwood TS620 (160-10) w/CW Filter - nice - \$450.  
 Kenwood TS430S w/AM/FM/SSB Filters, Mike \$650.  
 Kenwood TR3500 440 MHz 2 HT \$195.  
 Used HF Amps - several in stock including Heath SB 221 (2-3/500Z) 425.  
 Several good used 2 meter and 440 HT's in stock.  
 Icom 2AT \$135.  
 Icom 475A Demo \$950.  
 Yaesu FT737GX - MInt \$650.  
 Yaesu FP257 HID P.S. \$195.  
 Yaesu FT7 \$295.  
 Yaesu FTU 901 Xtrn - b-2 \$440.  
 Cas Fet preamp \$395.  
 Yaesu SP901P \$50.  
 Yaesu FT980 - Factory Repair - Exe. \$950.  
 Yaesu SP980P Speaker/Patch \$60.  
 Yaesu 757AT auto tuner \$225.  
 Yaesu FT101E \$350.  
 Yaesu FT301 = 20W Mobile H.D. P/S, and external VFO  
 all for \$325.  
 Yaesu FT620B 6 meter \$275.00.  
 Swan 100 MVA w/PSUS P.S. - Solid State Mobile \$300.  
 Adel 3804L CW Filter - 160-10M \$325.  
 Sony ICF 2002 5W Portable Revr. \$150.  
 Tokyo HI Power 30L (2/30 watt) 440 MHz amp \$65.  
 Henry 440 amp \$30.  
 Signal One - excellent condition - was Don Paynes personal radio.  
 Mods by Cunningham. \$650. Call for more info in this rig.

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 WE LOOK FOR SOME PRICE INCREASES  
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Wide selection of amateur antennas-base, mobile, HF, VHF, UHF at reduced prices. We  
 stock most of the better antenna companies products.  
 We carry a complete selection of books by ARRL, Ameteq, and the Callbook.  
 80 Hardcover Handbooks - in stock - \$20.  
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 North American \$22 - International \$24 - Both \$45.  
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Are You An ARRL Member?  Yes  No

Telephone \_\_\_\_\_

Full Member \$12.00

Family Membership \$15.00

Newsletter Only \$4.00

Age 65 or older, or under 18 \$8.00

Additional Names \_\_\_\_\_

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Class \_\_\_\_\_

Associate Member \$8.00

(Outside Teller & El Paso Counties.)